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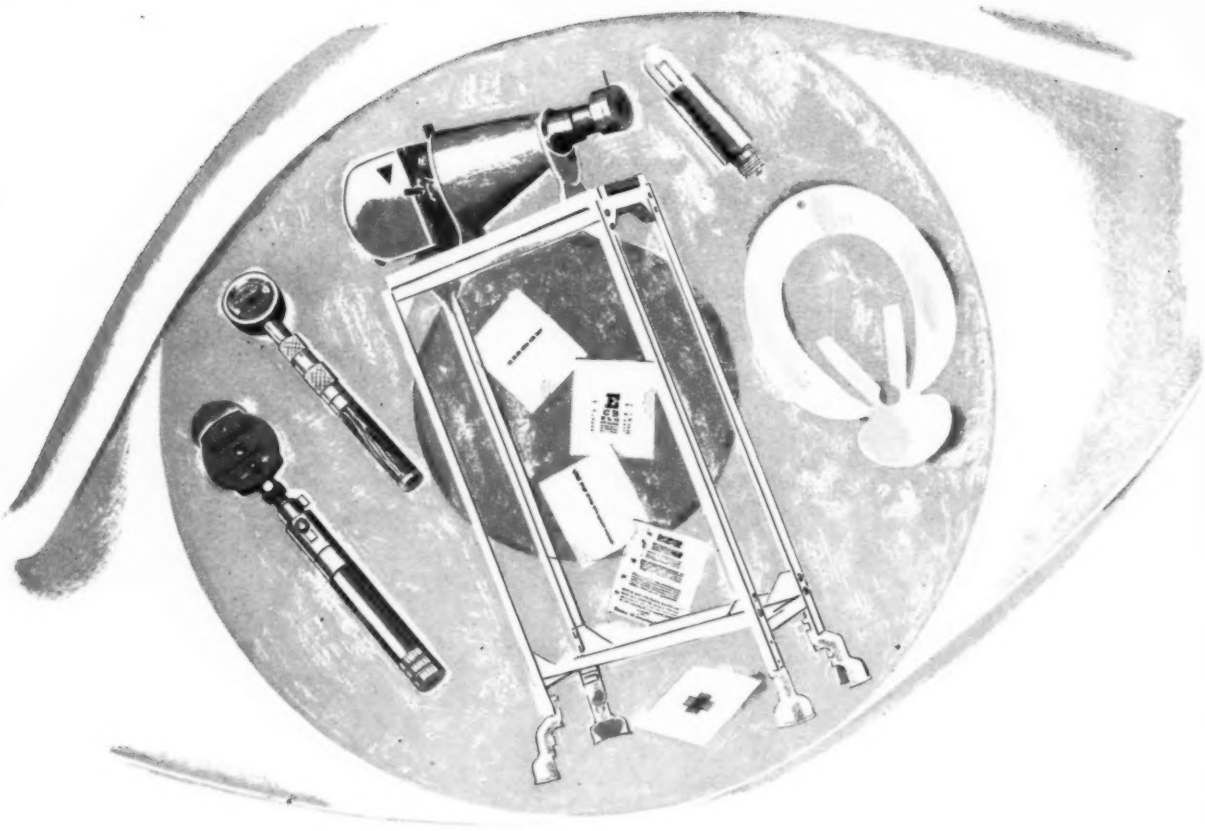

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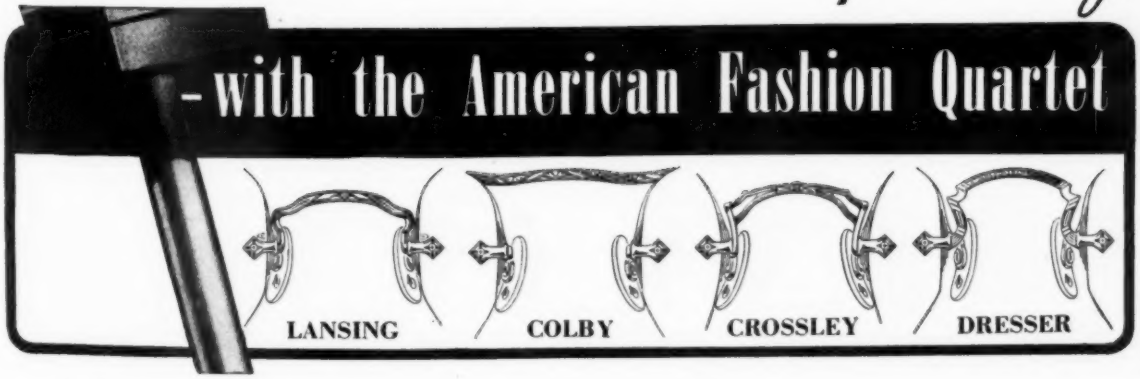

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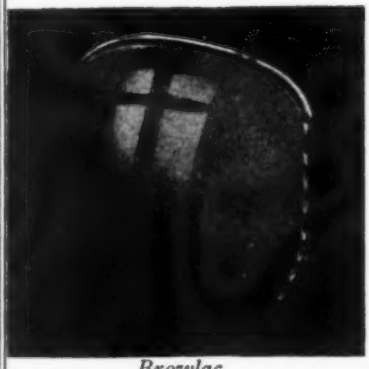

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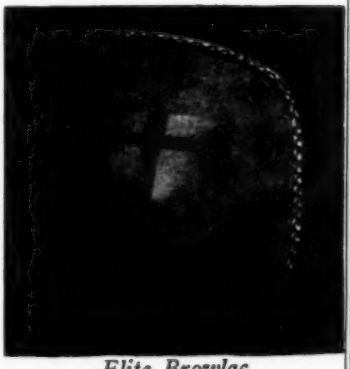

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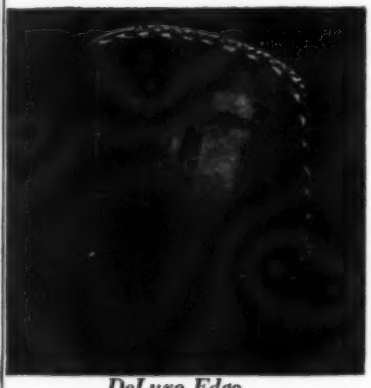

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TAIT'S ANALYSIS OF THE ACCOMMODATION-CONVERGENCE RELATIONSHIP*

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Tait[1] has postulated a "reflex relationship between accommodation and convergence, reciprocal and associative in nature, in which either can be conceived as the primary stimulus and the other as the response." Tait further specifies that this is a built up association which does not belong to the class of congenital involuntary concomitant movements.

This relationship which Tait has postulated, can be considered as analogous to learning paired non-sense syllables. If a number of pairs of non-sense syllables are presented to a subject on repeated occasions, eventually the subject will be able to call off either member of a pair when the other is presented by itself. In the same way Tait believes that the use of accommodation and convergence together in close work develops an association between the two such that, when either is stimulated, both respond.

Now if there is a reflex relationship between accommodation and convergence, reciprocal and associative in nature, one might expect the accommodation which is forced into play by convergence to be proportional to the convergence forced into play by accommodation.

Tait measured the convergence reflexly associated with 3 D. of accommodation by taking the phorias at 6 m. and 33 cm. and applying the following formula to them:

$$\left\{\begin{array}{c}\text{Acc. Con.}\\ \text{with 3 D. Acc.}\end{array}\right\} = \left\{\frac{\text{P.D. in cm.}}{.33}\right\} - \left\{\begin{array}{c}\text{Phoria}\\ \text{at 6 m.}\end{array}\right\} + \left\{\begin{array}{c}\text{Phoria at}\\ \text{33 cm.}\end{array}\right\}$$

*Submitted for publication April 30, 1940.

[1] E. F. Tait, A Reciprocal Reflex System in the Accommodative-Convergence Relationship, Am. J. of Psych., Vol. 45, pp. 647-662 (1933).

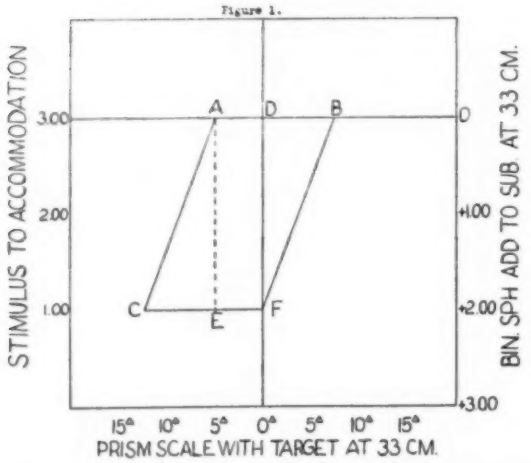

Fig. 1. Diagram showing the Relation of the Negative Relative Accommodation Finding to Accommodative and Positive Fusional Convergence.

He then compared this with the amount of accommodation remaining in play at the end of the skiascopic negative relative accommodation test at 33 cm. Tait argued that at least 3.00 D. add should be tolerated if it were not for convergence and hence, any finding less than this indicates that accommodation is forced into play by convergence. His findings definitely show that the negative relative accommodation increases as the accommodative convergence decreases and this demonstration was regarded as substantiation of the theory.

The writer does not aim to point out all the objections to Tait's analysis of the accommodation-convergence relationship but merely to show that the facts demonstrated by Tait are not incompatible with the type of analysis advocated by Maddox.[2] Maddox analyzed the innervation to convergence and accommodation into three components. (1) Accommodation and its inseparable accommodative convergence. (2) Positive fusional convergence. (3) Negative fusional convergence.

Maddox, as early as 1907, recognized that clinical measures of accommodative convergence include a certain amount of convergence which is dependent on awareness of nearness. The awareness of nearness probably calls into play positive fusional convergence, although it is not so certain but that this represents an independent form of convergence. If the convergence initiated by awareness of nearness represents positive fusional convergence, it simply means that the clinical measure of the

[2] E. E. Maddox, The Clinical Use of Prisms, pp. 158-178 (1907).

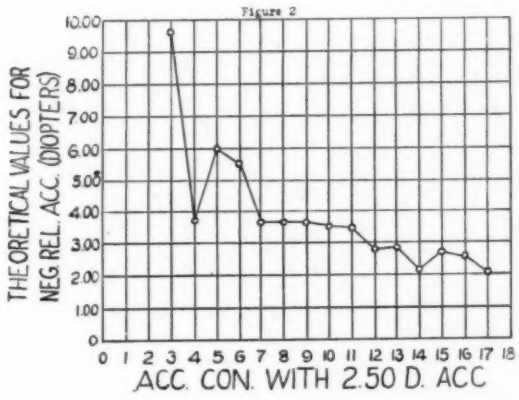

Fig. 2. Theoretical Values of Negative Relative Accommodation Computed from the Phoria Findings at 6 M. and 40 cm. and the Base Out to Blur Finding at 40 cm.

amplitude of positive fusional convergence ought to be increased, whereas that of negative fusional convergence should be decreased. The measure of accommodative convergence ought to be decreased also. Neither in this paper nor in Tait's paper have any allowances been made for the effect of awareness of nearness.

In accordance with the theory advocated by Maddox, the factors determining the limit of negative relative accommodation may be analyzed as follows. As plus lenses are added accommodation is inhibited and along with it the associated convergence. This decrease in accommodative convergence must be supplemented by an increase in positive fusional convergence. This process can be continued until positive fusional convergence is exhausted. This is illustrated in the diagram in Fig. 1. The point A represents the initial phoria at 33 cm. taken through the subjective. The line AC shows the increase in exophoria as the plus lenses are added. The reciprocal of the slope of this line represents the $\frac{\text{acc. con.}}{\text{acc.}}$ ratio. The point B is the base out to blur and represents the limit of positive fusional convergence. Plus lenses can be added till CE + AD = AB. AE therefore represents the negative relative accommodation.

Since CE/AE = Ratio of Acc. Con. to Acc.,
and since CE = DB = Base Out to blur finding at near

$$\text{Neg. Rel. Acc.} = \frac{\text{Base Out to Blur Finding}}{\text{Ratio of Acc. Con. to Acc.}}$$

With this formula it is possible to compute a theoretical value for the negative relative accommodation from the base out to blur finding and the $\frac{\text{acc. con.}}{\text{acc.}}$ ratio.

If it can be shown that a negative correlation exists between the theoretical values for negative relative accommodation and the $\frac{\text{acc. con.}}{\text{acc.}}$ ratios, this would account for Tait's empirical findings in terms of Maddox's analysis of the accommodation-convergence relationship.

In order to demonstrate what type of correlation exists, theoretical values for negative relative accommodation were computed from the data in 100 cases taken from the practice of the junior author.[3] Each case had an amplitude of accommodation of over 5.00 D. in each eye. The average theoretical values for negative relative accommodation were plotted against the accommodative convergence associated with 2.50 D. of accommodation as shown in Fig. 2 which is based on the data in Table I.

The accommodative convergence associated with 2.50 D. of accommodation was computed in accordance with the following formula:

$$\left\{\begin{matrix}\text{Acc. Con. with} \\ 2.50 \\ \text{D. Acc.}\end{matrix}\right\} = 15\triangle - \left\{\begin{matrix}\text{Phoria} \\ \text{at} \\ \text{6 m.}\end{matrix}\right\} + \left\{\begin{matrix}\text{Phoria} \\ \text{at} \\ \text{40 cm.}\end{matrix}\right\}$$

Inspection of the graph shows that in general the negative relative accommodation decreases as the accommodative convergence increases. The computed values are much higher than one could expect to get in actual tests at 40 cm. since +2.50 D. added to the subjective finding would give complete relaxation of accommodation. The measurement of negative relative accommodation would have to be made at a shorter distance than 40 cm. in order for the amplitude of positive fusional convergence to play an important role.

Additional light on the problem can be obtained by plotting the $\frac{\text{acc. con.}}{\text{acc.}}$ ratios against the phorias at distance and near as shown in Figs. 3 and 4. There is no significant correlation with the phoria at

[3] H. F. Haines, An Experimental Analysis of the Factors Affecting the Relationship Between Accommodation and Convergence, M. S. Thesis, Ohio State University, 1938.

TABLE I

Average Theoretical Values of Neg. Rel. Acc. for Various Ratios of Acc. Con. to Acc.

Acc. Con. with 2.50 D. of Acc.	No. of Cases	Av. Base Out to Blur Finding	Theoretical Values for Neg. Rel. Acc.
3	3	11.6	9.60
4	1	6.0	3.75
5	4	12.0	6.00
6	3	13.3	5.55
7	10	10.4	3.71
8	8	12.0	3.75
9	15	13.5	3.75
10	9	14.3	3.58
11	12	14.6	3.50
12	7	13.6	2.83
13	9	14.6	2.99
14	4	12.2	2.18
15	5	16.6	2.77
16	9	16.6	2.60
17	1	14.0	2.09

distance but a very definite positive correlation with the phoria at 40 cm. Furthermore, the phorias at near have a wider distribution, the standard error being $\pm 2.1\triangle$ at distance and $\pm 4.1\triangle$ at near. This means that variations in the $\frac{\text{acc. con.}}{\text{acc.}}$ ratio are made possible primarily by variations in the phorias at near.

TABLE II

Average Base Out to Blur Findings and Average Values for Positive Fusional Convergence for Various Phoria Findings at 40 cm.

Phoria at 40 cm.	No. of Cases	Av. Base Out to Blur Finding	Av. Total Pos. Fus. Con.
7	1	11.0	4
6	1	18.0	12.0
5	0	...	...
4	0	...	...
3	1	9.0	6.0
2	3	15.6	13.6
1	4	17.7	16.6
0	7	14.7	14.7
1	4	17.0	18.0
2	10	14.7	16.7
3	6	16.8	19.8
4	14	12.9	18.9
5	9	11.7	16.7
6	10	10.9	16.9
7	9	13.3	20.3
8	7	12.3	20.3
9	4	9.5	18.5
10	0	...	...
11	3	10.6	21.6
12	3	12.0	24.0
13	3	12.3	25.3
14	1	6.0	20.0

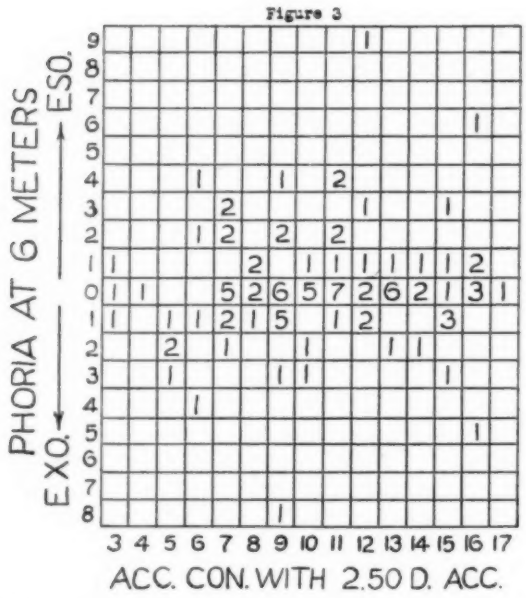

Fig. 3. The Relation Between Phoria Findings at 6 Meters and the Accommodative Convergence Associated with 2.50 D. of Accommodation.

Another fact to be noted is that the average base out to blur findings associated with various phorias at the near point remain relatively constant as can be seen in Fig. 5 which is based on the data in Table II. In order for this condition to exist, the total positive fusional convergence must in general increase as the exophoria increases or esophoria

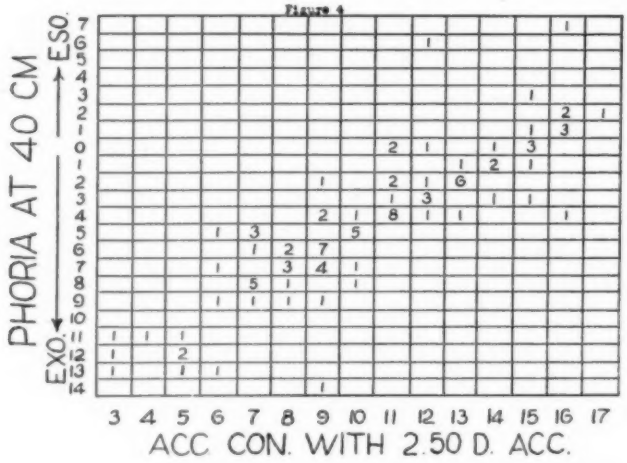

Fig. 4. The Relation Between Phoria Findings at 40 cm. and the Accommodative Convergence Associated with 2.50 D. of Accommodation.

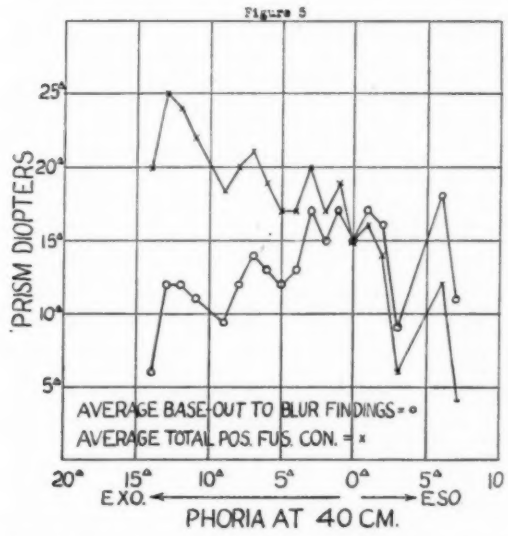

Fig. 5. Average Base Out to Blur Findings and Average Values of Fusional Convergence Associated with Various Phoria Findings at 40 cm.

decreases. The variation in average total positive fusional convergence is shown in Fig. 5. This is the logical thing to expect since it might be supposed that constant use of the positive fusional convergence to overcome an exophoria might build up the amplitude of this function.

If the base out to blur finding at near remains relatively constant, then according to the formula,

$$\text{Neg.Rel. Acc.} = \frac{\text{Base Out to Blur Finding at Near}}{\text{Ratio between Acc. Con. and Acc.}}$$

there must be a negative correlation between negative relative accommodation and the ratio between accommodative convergence and accommodation.

An effort to repeat Tait's experiment is represented in Fig. 6 using a subjective measure of negative relative accommodation rather than the skiascopic measure. The test was carried out by having the subject fixate the line of smallest clearly visible letters on the reduced Snellen chart, and adding plus lenses binocularly until one or more of the letters became illegible. The failure to obtain a significant correlation may be due to the fact that the measurements of negative relative accommodation were made with a target at 40 cm. rather than 33 cm. When the 40 cm. distance is used, the limit of negative relative accommodation in many cases

falls so close to the zero level of accommodation, that a satisfactory measure of negative relative accommodation can hardly be expected. Data obtained at 33 mm. might yield a correlation similar to that obtained by Tait.

In conclusion it may be said that Tait's correlation between accom-

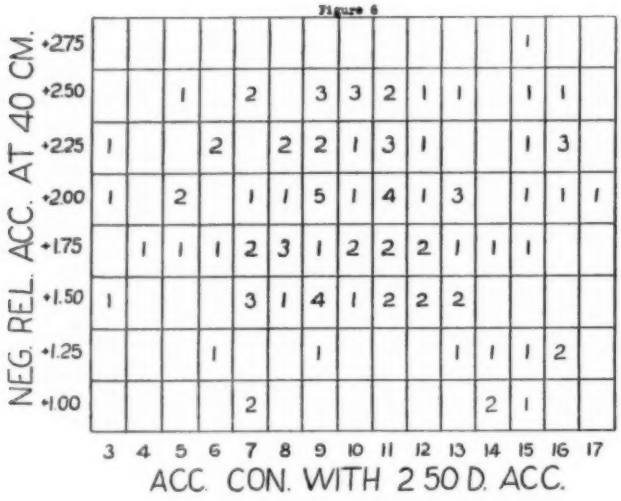

Fig. 6. The Relation Between Negative Relative Accommodation at 40 cm. and the Accommodative Convergence Associated with 2.50 D. of Accommodation.

modative convergence and negative relative accommodation is of no fundamental significance in itself but is made possible by a positive correlation between exophoria at the near point and positive fusional convergence which keeps the base-out to blur finding at the near point relatively constant.

The facts can all be accounted for in terms of Maddox's analysis of the innervation to accommodation and convergence.

SUMMARY

Tait's hypothesis of a reciprocal reflex relationship between accommodation and convergence is based upon the demonstration of a negative correlation between negative relative accommodation and accommodative convergence. An analysis of experimental data is presented to

show that Tait's correlation has no fundamental significance and is dependent upon a positive correlation between exophoria at the near point and positive fusional convergence.

DRS. GLENN A. FRY AND HOWARD F. HAINES
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PSYCHOTHERAPY FOR OPTOMETRISTS*

Lewis H. Kraskin, Opt.D., F.A.A.O.
Washington, D. C.

Very few of us learned very much about psychology in our optometry schools, but those of us who studied the subject later have the advantage that in addition to our clinical experience with psychological maladjustments, we also have the background and training of optometrists.

It is with gratification, however, that those of us interested in psychology note an increasing awareness and recognition by optometrists and physicians of the psychic component in disease. This interest is still very limited but it is definite and it is growing. One may understand the present point of view in light of the evolution of optometrical and medical knowledge. Going back only to the Middle Ages the healing art was dominated by a cloud of spiritualism and religiosity, when man was a prize sought after by the demons who waged a battle with the Lord for his possession. Priests played the role of physicians since only the spirit and soul mattered, and the body needed chastisement and torture. Then followed the struggle through the Renaissance and Reformation with the spectacular materialistic discoveries of Harvey, Koch, Pasteur, Ehrlich, and many others. The result was to discredit the existence of all phases of disease that could not be viewed in some kind of scope or measured or tested in some quantitative fashion. These anatomical, chemical, and mechanical advances have continued, and until thirty years ago did so, proportionately much faster, than advances in the psychological field. But the pendulum which swung so far to the right, and then to the left, is beginning to approach an equilibrium again, where both physical and psychic factors are viewed with equal scrutiny.

Sooner or later most doctors have moments of a philosophical turn when they are interested in considering the ultimate cause of disease. With their immediately allied workers they hold the unique position of being the army against death—some intangible force toward which all life is attracted. From the moment of birth onwards the individual starts this battle—a struggle against death. Expressed in more positive terms, it is a struggle to maintain life, and in the crises of disease, the doctor is the

*An abridgment of the material presented before the American Academy of Optometry.

last stronghold. Man, in a biological sense, reacts as do all protoplasmic masses, aided (or perhaps hindered!) by his greatly increased sensitivity. Biologically we must conceive of him as reacting as a unit, a total organism, to all stimuli with either flight or fight; and the result of either may be health, disease, or death. This flight or fight reaction is not accomplished in terms of muscle alone, or liver or brain, but as a complete entity which defies any separation into parts or segments. The older conception of a division into brain-mind-spirit and body-soma-organic is untenable; every reaction and every function of the individual in health and disease is a total one—psychosomatic.

Much as I wish to believe differently, I know that only a minority of doctors make practical use of such a viewpoint. The chemical and physical advances have given us an illusory pragmatic attitude which tends to limit our diagnostic procedures to physical means, to attempt explanations only in physiological and chemical terms, and to rely for treatment on chemical or mechanical means. But every doctor recognizes intuitively that his extreme pragmatism in sticking to materialistic conceptions is only a part of the truth. Even though he cannot reduce this particular imponderable to a ponderable and for practical reasons treats his patient for a specific organ disorder, for instance, of the eyes, he knows that the man functions in only apart through his eyes. The organ is only the focal point of a struggle that is also expressed in part through the autonomic nervous system, the endocrine glands, and the emotions—in short, through every body system.

We may grant that man's struggle for life is always a total organism reaction. Disease represents a particular type of flight or fight reaction in which we can readily see that there may be varying degrees of emphasis on either the psychic or the organic components. But all disease is included in this description, even though in some instances the emphasis is chiefly on the psyche and in others chiefly on the soma: never is it entirely on one or the other.

That a physiological background exists for the perseverance of an anxiety state as a part of a neurosis is very clearly shown by Drs. William J. Kerr, James W. Dalton, and Paul A. Gliebe, of the divisions of medicine and psychiatry of the University of California, Medical School, San Francisco. This background, they believe, is produced by the constant presence of some purely emotional disturbance. The physiological state produced by this emotional disturbance further aggravates its psychic component. Eventually a vicious cycle begins and symptoms of every variety may be found. These symptoms increase the severity of the emotional tension. If they are prolonged, permanent structural damage (i.e., genuine organic disease) may result.

Kerr, Dalton and Gliebe took a renewed interest in the physical phenomenon associated with the anxiety states (and their relation to hyperventilation) following study of a group of patients who, in addi-

tion to being in a tense anxious state, were also found to be suffering from so-called "convulsive seizures." They observed that these patients presented symptoms and signs of tetany associated with hyperventilation. Accordingly, they added to their examination of these patients an exercise in hyperventilation, by means of which they were able to discover that many symptoms were not those of organic disease, for they could be produced at will.

During the course of their investigation, Kerr, Dalton and Gliebe realized that there are a large number of patients (variously estimated as from one-fourth to one-third of the patients seen in general practice) who have, as localized manifestations of the anxiety state mechanism, a variety of symptoms referable to many structures in the body. In some of these hyperventilation precipitates and maintains a state of hyperirritability approaching clinical tetany. The symptoms may be so well localized in some cases that local disease is suspected without the discovery of universal functional disturbances.

The mechanism by which the anxiety state begins its physiological ravage is, at first, a repetition of attacks. These arise from emotional stimulation (fear) upon the sympathetic nervous system, which in turn becomes increasingly labile. The mechanism is perpetuated by the effects of the stimulus on the system of self-defense. Endocrine influence is noted at this stage. The next reaction is a state of hyperirritability which exists through the presence of tissue alkalosis, tissue hydremia, and tissue anoxemia. The resulting state of tetany may be regional or generalized.

The symptoms of tetany and allied manifestations, such as tachycardia, distended stomach and dilated urinary bladder, are enough to aggravate the neurosis because of the patient's fear of impending dissolution. Multiplication of impulses increases the bombardment of the sympathetic nervous system, making repetition of the reaction easier at subsequent intervals.

The mechanism by which an anxiety state, as part of a psychoneurosis, may produce genuine physiological and biochemical changes, which apparently form the background of the disturbance, is to be found in this diagram (Fig. 1) prepared by William J. Kerr, James W. Dalton, and Paul A. Gliebe, San Francisco. The initial problem concerned with fear or failure to adjust is usually in the realm of "romance or finance." Modern civilized life usually prevents the subject from fighting or running away from a difficult situation. Thus the effective responses to emotional storms are blocked. The progression from fear to neurosis is a simple process and symptoms appear which cause a patient to feel genuinely ill. Anxiety concerning health aggravates the fear and later the neurosis.

I have found that these same psychological manifestations exist in many individuals complaining about their eyes. Anxiety, restlessness, and fear are frequently observed, and yet these symptoms are non-

specific. In other words, they are descriptive terms and unless we are able to determine their specific significance they remain too general to give us any understanding of the cause or the cure of the disorder. Comparatively few (ocular) studies have been made in this field.

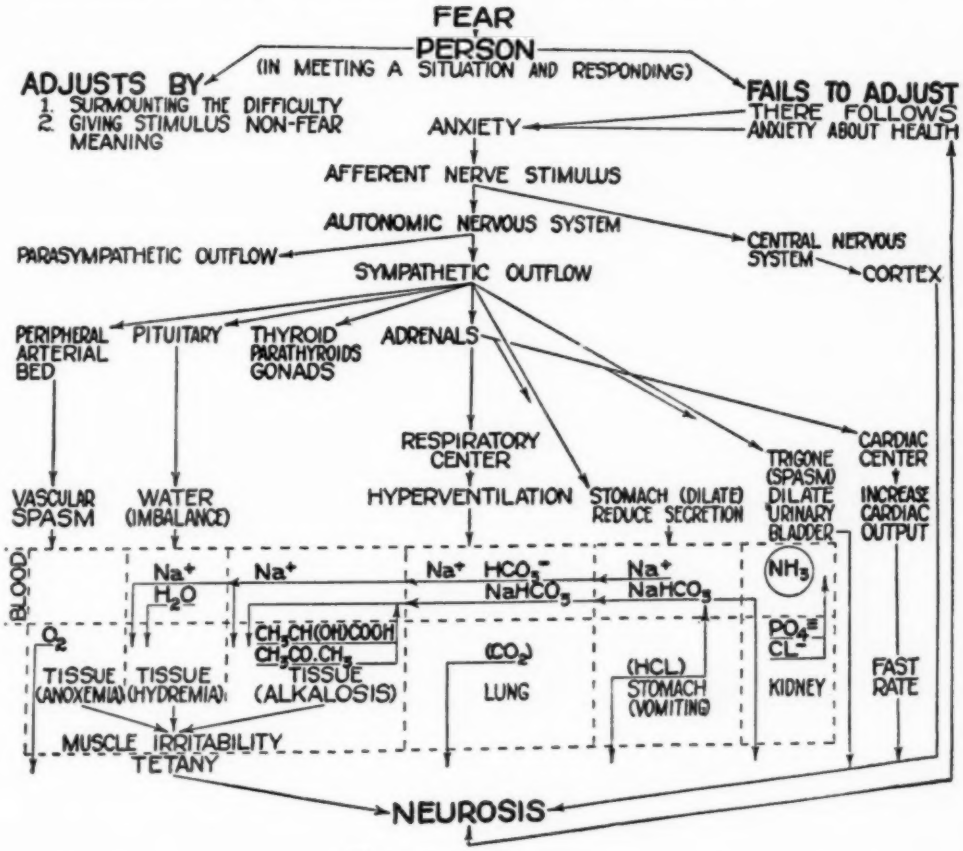

Figure 1. Kraskin.
Chart showing the mechanism of neurosis from the Annals of Internal Medicine.

It will be perhaps helpful to consider the possible variations in the clinical manifestations of such patients and I shall classify them in five groups.

In group 1 the mental symptoms (emotional response) are excessive, though there are few if any physical symptoms or eye findings. These persons have great concern that something is wrong with their eyes. Their concern about themselves is excessive.

In group 2 physical symptoms are the conspicuous part of the picture, and the actual concern or anxiety is minimal. This is a rather com-

mon finding in the so-called fatigue, that is a continuous general tired feeling that is not relieved by sleep, inability to read for any length of time. Usually these individuals have little concern about their eyes and the outstanding mental response is lethargy or "peplessness" rather than anxiety and restlessness.

Group 3 exhibits an equal emphasis on the psychological and on the physical symptoms. These are often untreated cases from the first group, which started with a great deal of fear and with minor physical symptoms. They early reached a situation in which a vicious circle was established—the fear caused more eye symptoms, and the increased eye symptoms caused more fear.

In group 4, eye symptoms and complaints are frequently a phase or a small part of a rather profound mental illness. Thus in a recent case, the patient's general picture was one of depression, but in this he first developed the idea that his "eyes were going bad," that he was "losing his vision and that his glasses were useless." Then his concern shifted to his feet which ached and pained and caused him a great deal of distress. With the development of the foot complaints his complaints about his eyes ceased. Then followed complaints about his gastro-intestinal tract —"his bowels wouldn't move": he was sure that he had an "intestinal obstruction"; at this phase his concern about his feet was forgotten. Then his interest shifted to his heart; he was sure that his heart was "failing": that he "didn't have strength enough to stand," that his "blood was thin," that his heart "just did not function correctly." This phase lasted perhaps two weeks, during which his chief subject of conversation and concern, and the chief factor modifying his behavior was his "bad heart." His interest then shifted to other organs, and his heart was forgotten.

Group 5 includes the most difficult cases to manage, both from the point of view of the organic and the psychologic situation. These are the individuals with definite organic eye lesions, who have superimposed upon the crippling effect of the lesion, or, perhaps more correctly, associated with it, many neurotic fears and doubts, and the treatment for one of these conditions is antagonistic to that of the other.

It is perhaps desirable to indicate the psychological point of view in organic eye conditions, namely, that psychological factors are effective just as they are in functional eye conditions. Considering first the possible etiology, logical steps can be defined: the emotional disturbance gives rise to a functional eye disorder; the emotional disturbance continues over a protracted period and the functional disturbance in the eye gives rise to structural changes. The eventual result is an organic eye condition. It is assumed, of course, that infections or toxins are also responsible for certain forms of organic eye conditions, but even in these instances it cannot be presumed that the psychological influences are negligible or unimportant.

If one accepts the premise that such disturbances as are understood

in "eye neurosis" are due to emotional stimuli, it is essential that we have some conception of how emotional stimuli cause physical symptoms. It is the doctor's responsibility to determine insofar as possible what the psychic stimulus may be, and "the frequency with which a psychic cause is established will vary directly with the thoroughness and skill with which it is sought."

Considering first the patient's present illness, the doctor has opportunity to scrutinize the possible precipitating factors in the illness. It is recognized that the initiating influences or incidents are only "the straw that breaks the camel's back," and not the chief load. Nevertheless, it is helpful in evaluating the case to determine the precipitating incident. We can group these factors into four classes: (1) the chance or casual statement of a doctor or life insurance examiner, relative to some inconsequential finding, which may precipitate an emotional disturbance which results in eye symptoms; (2) the occurrence of some dramatic case of eye disease among relatives or friends of the patient; (3) the occurrence of some sudden pain, or perhaps a transitory blur which focuses the person's attention on his eye; and (4) a profound or protracted emotional disturbance such as grief, defeat, or financial loss.

In all cases these precipitating factors only seem to bring about the illness, and in no instance causes it.

Before one can understand the cause of such illnesses, it is necessary to have some grasp of the psychological mechanism involved where an idea is converted literally into a physical symptom—where a thought process becomes mirrored in a physical attribute. To attempt to explain such phenomena merely by saying that they are emotional disorders is too general to be helpful. Even to specify them as anxiety, grief, or fear doesn't help much. That ideas or psychological stimuli can produce physical changes is apparent to everyone in such simple phenomena as blushing, the development of goose-flesh, the engorgement of the erectile tissue, and the peristalsis of hunger. However, the doctor is too inclined to ignore such simple examples when studying the psychologic factors in an individual who manifests physical symptoms.

It has become possible only through the findings of psychoanalytic study to explain these phenomena. Fundamental is the conception of the unconscious, a part of the personality which not only houses the energy of the primitive strivings and drives, but is also the receptacle in which many of our forgotten and tabooed ideas have fallen. More literally, they have been forced from our conscious recognition into this unknown part of the personality. This psychologic process in which we automatically exclude from our conscious recognition ideas or desires which are socially unacceptable we call repression. We "forget" the ideas, but their emotional content forms a powerful factor in our lives. To over-simplify an illustration: if the child is mistreated by his father, is cheated, is neglected, is the object of cruelty, he may in his childish way "hate" his

father; perhaps subsequent events cover that up; he learns to appreciate a good side of his father, perhaps enough to make it impossible for him to justify his childhood hate. He then "forgets" this hate—it is repressed —but all unknowingly to him, he expresses this hate in subtle ways, not only to his father but to every person who comes into his life as a father substitute, namely—the teacher, the minister, the older partner. I do not infer that eye neuroses are necessarily due to repressed hatred but we can assume with surety that every individual who subsequently develops such symptoms as are typified in these illnesses has stored up with his unconsciousness, powerful unrecognized and unacknowledged psychologic desires or wishes.

The second act in the development appears when the individual meets a particular situation, one of the precipitating factors mentioned above, or perhaps a much less obvious immediate causal situation. The power of his repressed desires demands expression. The social situation, however, does not permit this expression and perhaps even much more inhibiting, is the person's own conscience. It is under such circumstances that the individual apparently turns upon himself—his idea is converted into a physical symptom, which accomplishes not only the expression of his forbidden desire, but also because of his own conscience reaction is a punishment for himself.

Thus we can see in an individual with a so-called "eye neurosis" some of the results of this conversion of the idea or wish into a symptom. It greatly intensifies his interest in, in a sense, his love for himself. It permits him to gain an inordinate amount of attention, not only from his family but from doctors. It is an inconvenience, a handicap, and even a liability for all those who have relationship to him, particularly if they are dependent on him. Thus, the symptom represents the expression of the unconscious desire, but simultaneously we can see that the patient suffers, he is in distress, he may have pain—all of which are manifestations of self-punishment. His reaction is thus much like the little child, who after sufficient experience with a particular type of parent learns that he may take a piece of candy if he will slap his hand first.

We have learned from psychologic studies that in every case in which the individual chooses an organ, in a sense, "falls in love with it";— invests it with great interest and concern—introspection; he goes through these psychological steps in repressing powerful emotional desires into his unconscious. Then these are subsequently converted into symptoms.

Why, we may ask, does he pick out his eyes? Do the eyes have a special significance for the individual, and if so, why? Unfortunately, as yet very few cases of eye disorders have been studied psychoanalytically —the only method by which we can definitely determine the specific significance of the choice of the eye as a method of expression. As a consequence, our information is too limited for us to draw conclusions. Furthermore, it is inconclusive and possibly not valid to relate the details

of a few cases that have been so studied in light of the hundreds of thousands of eye cases which are studied clinically.

Nevertheless, the meagerness of our data should not deter us from expressing some suggestions about the possible significance of the eye symptoms. It would appear that eye disease and eye symptoms are (sometimes) a reflection of strongly aggressive tendencies (intense hate) which have been totally repressed. The patient's hate, derived perhaps from early childhood situations toward some member of his family, or perhaps later toward someone in his immediate environment, is completely denied by the conscious part of his personality, and becomes expressed through his eye symptoms. The psychological mechanism known as identification, in which the patient unconsciously assumes attributes of another individual, may also play a part. It is a well known fact that there is a definite tendency to inherit eye disorders. It is frequently observed that the person who represented the specific object of this hate, perhaps the father, also had eye difficulty, and thus by identification, the patient himself unconsciously chooses the eye to express the emotion.

The optometrist does not need to be a psychoanalyst, nor does he need to use psychoanalytic technique, to make observations which may corroborate this theory. In my many contacts with such patients, I have been impressed by the frequency of an unrecognized hate, in their make-up. This finding has also been repeatedly corroborated to me by various optometrists. For what value it may be, we have the layman's own emotional attitude towards the eye, expressed in the various colloquial terms, many of which I mentioned in previous papers, that concern themselves with the question of love and hate.

In the management of the individual with funtcional eye disorders, one has to first evaluate the case as to its etiologic factors and the severity of the illness. Some cases are distinctly a matter of minor psychiatry or minor psychotherapeusis, and others are problems for major psychiatry. The criteria for determining into which of these two classes they fall, may be summarized under four headings: (1) the environmental factors, (2) the past health history, (3) the patient's past adjustment to business, marriage, children, friends, and (4) other evidences of psychologic maladjustment in the present picture.

In evaluating the environmental factors, the optometrist should concern himself with determining the patient's attitude toward his early family constellation, particularly his relationship to his mother and father and his brothers and sisters. Frequently it is possible to determine the presence of unhappiness, distress, and even misery surrounding the childhood which modifies the person's reaction throughout the rest of his life. If the childhood has been grossly abnormal, it is likely that the eye symptoms are an indication of a major psychiatric problem.

In obtaining the past health history, the optometrist should especially inquire as to previous psychologic adjustments. The great

frequency of a history of previous "nervous breakdowns," has been noted repeatedly by internists in discussing this subject. Similarly, a history of "emotional instability" is often obtained, or introspection, great suggestibility, or a morbid concern about health, all of which can be determined in the course of obtaining a routine health history.

In evaluating the patient's adjustments in other fields it is extremely important to determine just how much of a fit or a misfit he has been in his business, in his marital relationships, in the responsibility and interest he has in his family and friends. When we obtain a history that a patient has changed jobs frequently or has had a dominating attitude of selfishness toward his family, or that he has been interested in his friends only for what he can derive from them, we are usually dealing with a major psychiatric problem.

In evaluating the eye symptoms it is essential to look for other evidences of maladjustment in the present difficulty. The eye symptoms may be only a small part of a much larger picture with many other complaints and many other systems involved. They may be only the prodromal symptoms of psychoses.

It is an observed fact that the great majority of the individuals with functional disorders of the eye are competently managed by the average optometrist. As these men learn more it is probable that the psychiatrist may see even fewer cases than at present, which is rightly so. On the other hand, as the understanding and mutual helpfulness between optometrist and psychiatrists increase, there may be a gradual breaking down of the feeling that exists towards the psychiatrist and his work which has limited his availability. A few optometrists have pointed out that the treatment of certain cases of "eye neurosis" require technical psychotherapeutic methods in the hands of an expert. A larger number of optometrists agree that the only treatment of importance is psychotherapy. Unfortunately, the recommendation for psychotherapy is often given in a lecture or a textbook without explanation as to what is meant. Thus, the recommendation, and the subject is dismissed with a wave of the hand as if it were some concrete measure, like the prescribing of +1.00 D. lenses.

Therefore, it seems important that we recognize that we optometrists have wide variations in our conception of psychotherapy, that it has many different forms which are applied in various ways. Certainly we have no right to ever assume that our patient knows what we mean by "psychotherapy." In fact, we probably have no right to use the term. Unless the optometrist takes the trouble to explain to the patient the interrelationships of his emotions and his organs and the fact that his symptoms are an expression of his total personality, he is not likely to accept or profit from any kind of psychotherapy.

Consequently, when I state here that "psychotherapy" is the chief therapeutic recommendation it needs amplification. The optometrist must

first supply reassurance. This reassurance is not merely a matter of words, since the patient is often impressed more with the attitude an optometrist assumes rather than with what he says. Perhaps the most important method of giving reassurance is by making a careful study of the patient. A detailed and thorough examination from the psychologic and physical standpoint impresses the patient with the optometrist's interest, and indicates to him that the optometrist has a basis for statements he may make at the conclusion of such an examination.

These patients can profit by a limited amount of education regarding the eye and its physiology. Statements the doctor makes to the patient about his eyes should be made only after a thorough examination; only then can the patient appreciate that the optometrist knows what he is talking about. Statements the doctor makes should be positive and definite, and if he is in doubt about certain points it is better not to mention these. It is advisable to tell the patient his significant findings and through an educational procedure, which is essentially psychotherapy, to explain the cause and relationship of his symptoms.

Another practical point in psychotherapy is a sufficient evaluation of the environmental situation to make recommendations regarding it. Sometimes this means a change in the status of the patient, or a change in his relationship to his family, or possibly even in his business. In making such recommendations, however, the optometrist needs to do so cautiously and guardedly. For instance, it is much more advisable to help the patient evaluate the environmental situation, pointing out to him conflicts, which he may not see, more or less leading him to the conclusion that such factors in the situation should be changed. The same guarded attitude should be used relative to interpretations. When the optometrist may recognize the psychologic implications in the patient's illness, the hate or jealousy, he should be guarded in explaining these psychologic mechanisms. In prolonged psychotherapy this is desirable and important, but too frequently, after only short contacts with the optometrist, the patient does not have an adequate grasp of these factors, at least insofar as they are related to his own unconsciousness; consequently, he either misinterprets or fails to understand such interpretations. However, the optometrist, on the basis of his understanding of the psychologic mechanisms, can often effect helpful psychotherapy by guiding the patient into changes in his environment, in undertaking new or substitute interests.

Treatment of neurotic patients should be divided into types; palliative and curative. The latter procedure consists of the use of such means as psychocatharsis, re-education, reassurance and the substitution of a non-fear meaning in situations where desensitization is needed. The palliative measures such as prescribing for refractive errors or orthoptic treatment have very definite use for several reasons. Through immediate relief of symptoms, part of the cause of the neurosis is removed—namely that portion dealing with the patient's concern regarding his eyes. His

eyes feel better for the first time in months and therefore, the emotional rapport with the optometrist is made stronger, so that the psychological procedures (mentioned above) may be performed much more easily. Also the demonstration illustrates to the patient the mechanism of the physiological difficulties which he himself has caused, and the results are so dramatic that he is able to follow the procedure and to appreciate what the results mean to him. He is then in a position to check the physical changes at an earlier period, and to save himself from more profound disturbances.

The role of drugs and a special regime and rest are all of minor importance. It is universally agreed that drugs are not indicated, and in fact, are harmful, except for the possible use of mild sedative. To prescribe a regime is in some instances harmless, but if it permits the patient to play the role of an invalid or emphasizes his incapacity to be as other humans, it is likely to do more harm than good. Rest is rarely indicated and often is contra-indicated, for the same reasons. To place limitations on the patient's activities likewise creates a contradiction in the optometrist's attitude; for certainly if he tells the patient that his eyes are all right, he has no grounds for inferring that this is not true through the limitation of the patient's activities. It is usually advisable to know about the patient's use of alcohol and tobacco, though again, it is usually unnecessary to restrict these. When restricting it can be done on the basis of the pharmacology of the drugs contained in them and their effect upon the eyes which perimetry will reveal, rather than any inference that the eyes are not all right.

When the individual with a functional eye disorder becomes a "major" psychiatric problem (as judged by the criteria listed), he needs to be under the care of the psychiatrist. The optometrist can advantageously keep in mind, however, that if the psychiatrist is to achieve success with the patient he, the referring optometrist has certain responsibilities. This responsibility for the most part is concerned with giving the patient sufficient explanation and preparation for his visit, i.e., the part played by emotions in all diseases, etc. Too often the patient is referred to the psychiatrist with some naive idea that he is going to some "specialist" who is particularly interested in eye disorders. On discovering that the psychiatrist is particularly interested in emotional difficulties the patient is all too prone to assume immediately that both his referring optometrist and the psychiatrist think that he is "crazy." Consequently, unless the patient himself has some recognition of the psychologic component in his illness, he is not likely to accept psychiatric help.

The psychiatrist classifies these types of difficulties into various larger groups of the neuroses and psychoneuroses. Sometimes it is necessary to change the environment, namely, to hospitalize the patient. Particularly is this true when the eye symptoms are only a part of a much more extensive and complex difficulty. In some instances psychotherapy

is given by the psychiatrist in which the patient's problems are evaluated with superficial interpretations in terms of relationships to people (family and friends) and reactions to his business, to his problems, to his interests. We can assume that in some instances the technique of psychoanalysis is indicated as offering the most likely help for the individual. The application of this form of psychotherapy, however, is of necessity limited to a relatively small number of patients—an infinitesimal number in contrast to the great group so afflicted. Psychoanalysis must be a limited procedure because of the amount of time it requires, and the consequent expense.

Summary

It has been my purpose to indicate that the so-called "eye neuroses" are one example of a much larger group more technically termed the "organ neuroses." These illnesses in all instances represent the conversion of a psychologic stimulus into a physical symptom, attached to a particular organ. The understanding of such illnesses is possible only through an understanding of the psychologic mechanisms. In the functional eye disorders it is suggested that their origin is intimately related to a completely repressed and thus totally unconscious hostility. Their treatment belongs entirely in the realm of psychotherapy, and this psychotherapy can and should be given in the great majority of cases by the optometrist or the internist. If he recognizes that his function is to treat the personality—perhaps more specifically, the mind of his patient, and not the eyes and he does this with tact, conviction and intelligence, he is likely to be rewarded by results quite as brilliant and as satisfying as are obtained in any field of healing.

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LOW COST FIELD CHARTING*

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Because of the splendid work of the optometrist Brombach, the profession is rapidly becoming interested in the analysis of the peripheral fields of vision. Many, I fear, are withholding entry upon this endeavor because of the necessary equipment and its cost. The required instruments generally run well into three figures, thus making it a definite factor of capital cost. It is to those to whom this is an item that this article is directed.

Three general types of instruments are now in common usage and are accepted as standard. All of these can be reproduced for a very nominal sum. Various optical manufacturers offer elaborate devices which are unquestionably superior to those here described. As I have said before I am endeavoring here to aid the man whose funds are limited. Those who have the resources had best purchase the finest equipment available and read these suggestions no further.

The tangent screen being the simplest, we will first give it our attention. A most satisfactory one meter tangent screen may be had by securing a piece of one quarter inch pressed wood, 48 inches square or larger. Drill two holes at the top to which attach chalk line and pulleys for controlling the height. Cover the surface with a dull, gloss free, dead black paint. On this surface draw, with a lead pencil, the required meridians and isopters, as indicated in any text on perimetry. For accuracy of the circles drive a nail through the geometrical center of the board. The desirability of using the lead pencil lies in the fact that there is but slight contrast between its marking and the background. A string should be attached to the nail and to the pencil, at a length equivalent to the radius of the desired isopter. With the string held taut and the pencil in the proper position have an assistant rotate the screen while the pencil

*Submitted for publication April 29, 1940.

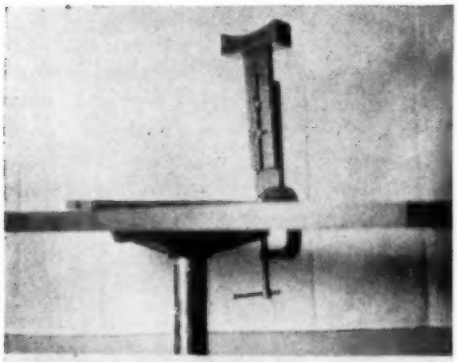
is held firmly. In this way the circles will be perfect. If one attempts to rotate the pencil about the axis neat points of junction are difficult to form. The following table gives the necessary measurements in inches for the various radii which are calculated for a working distance of forty inches.

Degree	Tangent		Radii	Degree	Tangent		Radii
5	.0875	equals	3.5 inches	30	.5774	equals	23.10 inches
10	.1763	equals	7.0 inches	35	.7002	equals	28.00 inches
15	.2679	equals	10.71 inches	40	.8391	equals	33.56 inches
20	.3640	equals	14.56 inches	45	1.0000	equals	40.00 inches
25	.4663	equals	18.65 inches				

For clinical purposes the nearest half inch will be sufficiently accurate. It is obvious that if a forty-eight inch screen is used 30 degrees will be the limit of the field. A tangent screen of any dimensions may be had merely by multiplying the above tangents by the working distance. If the patient were to be placed at 80 inches the tangents are multiplied by 80 instead of 40. If one prefers to use the metric system the same principle would hold true, simply substitute 100 cm. for the 40 inches and draw the radii in centimeters.

Placing the blind spots may prove more troublesome. The dimensions of the spot for a one meter screen are approximately as follows. Vertically 122 mm, horizontally 89 mm, or 5 inches vertically and 3.56 inches horizontally. Locate the inner margin of the spot 232 mm or 9.3 inches from the center of the screen along the zero meridian. The outer edge is approximately 321 mm or 13 inches from the center. The superior margin is located 37 mm or 1½ inches above the zero meridian.

If one desires to construct a 2 meter screen the outer margin is placed 632 mm from the screen's center, inner margin 460 mm from the same center, superior edge 80 mm above the zero meridian and the lower 170 mm below the same meridian. These measurements may be converted to inches by dividing by 25. The above comprises the four cardinal points and they must be joined forming an ellipsoid. The same measurements hold true for the left eye only the spot is located upon the opposite side of the screen. To the above should be added an adjustable chin-rest (Fig. 1), which may be easily made by a competent carpenter. Also a small white fixation object or spot should be placed in the exact center of the chart. The targets used with this instrument are the customary Heidelberg colors placed on a wand, the size ranging from ½ degree to 1 degree, which will be found quite satisfactory. A ½



Abbott. Figure 1.

degree target for 1 meter will have a diameter of about 8.7 mm and a 1 degree, 17½ mm. At 2 meters the diameter will be 35 mm.

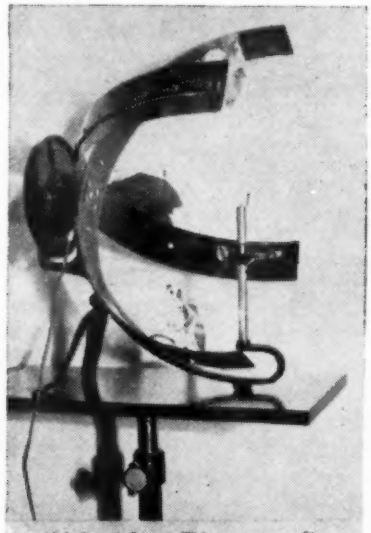
The patient is seated with his eyes one meter from the screen, directly in front of and level with the fixation point. Approximately two feet behind and above the patient, suspend an unshaded 100 watt incandescent lamp at a position that will allow the screen to be free of the patient's shadow. All other illumination in the room should be dimmed. This lighting may not be standard but for the average practitioner the findings will be sufficiently accurate so long as the variable factors; targets, lighting, etc., remain constant, the exact amount of illumination is of no serious technical consequence. In shifting eyes from one eye to the other, either the patient or the screen must be moved slightly to the right or left, for if the eye is found to deviate for fixation the facial features will alter the size of fields.

Assuming the right eye is under test, the left eye is then covered with an eye pad. The target is started from the margin of the screen slowly along the horizontal meridian until a point is reached at which the patient recognizes and retains the color when motion is checked. This point is located and recorded upon the record sheet, exactly as found. This is repeated with blue, red and green on each of the eight cardinal meridians. The current technique is to completely chart the blue in all meridians then repeat for the red and green. Form fields are charted with the white target, the only alteration in technique being that no regard to color recognition is considered. The blind spot can be easily outlined with this instrument by using a small white target, outlining and recording the points of vanishment and reappearance.

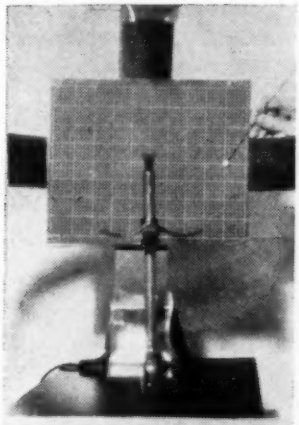
Among practicing optometrists, the perimeter appears to be the more popular if not the most desirable instrument. The present day instruments are built on the same principle as their early predecessors, namely a metal arc on which the fields are measured. The modern instruments have many improvements such as better illumination facilities and various recording devices, but basically there have been no changes.

Many old models of perimeters may now be purchased for a few dollars. Those who have had clinical experience with them have soon become aware of their major defect, which is most decidely the impossibility of securing proper lighting in all meridians as the arc is rotated. If the lights be placed behind the patient he casts an interfering shadow, if the light be above, the target is in the shadow of the arc, when taking the vertical meridians. In fact, it is impossible to secure equal lighting in all meridians from a general source of illumination. An optometrist, who is interested may readily rectify this defect by enlisting the aid of a local sheet metal worker.

A piece of sheet iron approximately 1 mm thick, three inches wide, and 36 inches long should be rolled into an arc conforming to that of the perimeter. Five inches from either end the optometrist should attach a miniature lamp socket into which is placed a 15 watt lamp. Between the lamps and the extremity of the arc one should connect a tin reflector. This



Abbott. Figure 2



Abbott. Figure 3

reflector must be so bent as to evenly illuminate the perimeter and shade the patient's eyes from all direct rays. If these instructions are closely followed and the instrument be used in a room having no other illumination the results will be pleasing. In redesigning some of these old instruments the light carrying arc may interfere with the track over which the target must travel, if this be the case the targets intended for the tangent screen equipment will suffice. The target is carried along the arc by a black gloved hand, as shown in Figure 2. Personally, the writer prefers this technique to the carriage. The carriage in traversing the rails produces disturbing noises, which often distract the patient. This difficulty is eliminated by discarding the carriage.

Campimeter equipment may be added to the above by obtaining a piece of tin 9½ by 11½ inches and to the back of which attach two small hooks. To this clip or attach a Brombach campimeter chart No. A.O. 480Z as shown in Fig. 3. This little device is used for charting central fields, searching for scatoma and outlining the physiological blind spot. The technique merely consists of having the patient hold fixation upon a designated point, while with a small white target we traverse the field vertically then laterally forming a grid of approximately one inch squares. The points at which the target disappears are outlined as either the physiological blind spot or areas of scatoma. Much information is available concerning the interpretation of perimeter findings but detailed instrumentation as to the proper technique of charting a field is difficult to obtain. Writers are prone to overlook the simple fundamental instructions, which are most vital to the beginner. For best results place the instrument before a black background such as a black curtain or the tangent screen, the patient is seated comfortably with his head well into the rest, one eye at a time occluded and directed to look with the other at the fixation point found at the hub of the arc. A blue target is slowly but steadily carried along the arc from the temporal side of the patient towards the central point of fixation. The average speed should be such that it takes about 25 seconds to travel from the 90 isopter to the zero. The isopter at which he recognizes and retains true color recognition is recorded on the zero meridian of the record card. Next the blue target is advanced inward from the nasal side and the point of recognition is recorded on the 180 meridian of the record. The superior temporal quadrant is likewise recorded on the 45 meridian. The inferior nasal is recorded upon the 225 meridian, and so on throughout the eight cardinal meridians. As the target is brought down the medial plane from above

the patient's head the point of recognition is recorded upon the 90 meridian of the card and as the target moves up the medial plane from below the patient's chin the point is recorded on the 270 meridian of the record card. The above procedure is repeated for red and green.

In most cases a target of 5 mm in diameter will suffice. If visual acuity be very low, larger targets may be used. The general procedure is to remove correcting lenses when charting a field, if the correction be unusually high it is advisable not to remove the spectacles. Some may experience difficulty in understanding why we record all fields in reverse except those of the vertical meridians. Until enlightened by Dr. Embrey, I had been given no logical explanation. He most easily cleared the point by explaining that the 90 and 270 meridians form the axis of rotation when the card is removed from the instrument, and in reality we are not reversing for any of the meridians as one is apt to believe upon first thought.

The visual fields are the projection of the retinal conditions. It should be borne in mind when we are charting the right temporal fields we are in reality recording the condition of the nasal portion of the retina of the same eye. Abnormalities found in the temporal field of the right eye indicate an involvement of the nasal portion of the retina, the right optic nerve, the commissure, left optic tract and the left visual centers of the brain. The converse is also true. There are instances however where this reasoning is not born out in actual practice for there is a considerable communication of the nerve fibers from eye to eye along the visual arc. The majority of nerve fibers supplying the temporal rods and cones follow a lateral course to the brain. The nerve fibers leading from the nasal rods and cones are more mixed, here the predominating number of fibers cross to the opposite tract at the commissure and follow it to the brain, a considerable number follow the optic nerve to the commissure, there join the opposite optic nerve and follow it back to the other eye. The optometrist who provides himself with the described equipment will be well prepared to chart any field which may present itself. The instruments here described will not appear amateurish in the best of offices. My aim has been to encourage those who are not charting peripheral fields to no longer delay and to explain how this may be accomplished without a large outlay of money.

DR. A. N. ABBOTT
SHAWANO, WIS.

Current Comments by Carel C. Koch

Editor, American Journal of Optometry

Optometrists will confer a favor by sending for this department items of news of general interest: such as relate to new instruments, clinical techniques, education, public health and optometric legislation.

HEADQUARTERS OFFICE OF A. O. A. SHOULD BE LOCATED AT ONCE IN WASHINGTON

The secretary's office of the American Optometric Association has become, during the past several years, an increasingly important factor in optometric well being. This is particularly true since the trustees of the A. O. A. have designated that office as a full-time staff position with adequate annual compensation. The change-over of the secretary to a full-time staff position was a wise and necessary step on the part of the officers and trustees of the A. O. A. and they have no doubt already felt the benefits of this move. Certainly better organization planning should result, and the multifarious details accompanying such vital work will be carried out more thoroughly and with greater dispatch.

In these critical times we are fortunate in having as secretary of the A. O. A. a man who has long held this position and who is acquainted with numbers of optometrists everywhere. His very large acquaintance, gained in the 19 years he has held this post, enables him to choose and quickly communicate with individual optometrists who are leaders in every part of the country as emergencies arise, and as local men are needed to assist in solving sectional problems as these develop within the A. O. A.

The splendid manner in which the trustees handled this important personnel problem of placing the secretaryship on a full time basis, was, indeed, a step in the right direction. With that now accomplished, the writer would like to place before this administrative body of the A. O. A. the additional proposal that they create, for the American Optometric Association, a well located official organization office. A new headquarters office for the A. O. A. under the direction of the secretary, for this professional society.

In fact, in one sense, this has already been done, but the present geographical location of the office and the secretary is bad. While Minneapolis is an excellent city in which to live and to practice, (the A. O. A. secretary moved here 4 years ago) it has certain disadvantages when

considered from the standpoint of the headquarters city for an active National Society. The real headquarters of an organization such as the A. O. A. are naturally where the secretary maintains his office and in times like these the headquarters of the A. O. A. should be in Washington, D. C. Here our secretary could collaborate and assist Vice President Dicus, who is in charge of our national affairs committee and by their combined presence would strengthen the position of optometry in the critical professional period ahead.

In Washington, our secretary would be located at the very heart of governmental activities. He would be in a much better position to evaluate the forces which are now at work attempting to change our economic and professional existence. He could best serve our state associations through a Washington office and certainly would be a more valuable employee in that city, than he is at present, located as he is, in the north-central portion of the country. Having him on hand at the very center of governmental activities strengthens our national society and our position as an important force in the future planning of the health needs of America. The move would not be necessarily a costly one and if carried out at once may prove to be of immense value and benefit to every optometrist. Minneapolis would be sorry to see him go, but optometry, we are sure, would be best served by this change.

REFRACTIVE TRAINING AND THE OCULIST

An interesting little volume appeared on the writer's desk one day last week. This loose leaf text book, for such it proved to be, goes by the impressive title of *Cardinals of Optics, Physiological Optics and Applied Refraction*. The author of this series of home lessons on ocular refraction, for the general practitioner of medicine and the family physician, is Ralph H. Woods, M.D., of LaSalle, Illinois. This brief course in the whys and wherefores of eye examining seems to be the cornerstone of his celebrated (?) post-graduate course in refraction.

The oculist and educator Woods starts out by assuring the physician who has enrolled in this course and who presumably wishes to present himself to the public as an eye specialist, that the refraction of the eye is a simple mechanical process. He claims also that if handled skillfully, glasses can be fitted with profit and without endangering the physician's ethical standing by appearing to profit through what Woods refers to as, a merchandising transaction.

The text itself contains a review of most of the older material on refraction found, for instance, in Thorington, as well as an occasional touch of originality. At one point Woods injects this thought. He attempts to classify ocular involvements and gait abnormalities. The stomping gait, the staggering, the pseudo tabetic, the spastic, the mowing, the propulsion, the waddling and the goose gait are all introduced and are somehow alleged, by this teacher and trainer of oculists, to have some diagnostic significance in doing eye work. If there is anything in all this, and the writer is in no position to comment thereon, it is obvious that in the future the ideal location for an oculist's office would be at the end of a long corridor with the desk of the eminent specialist so placed, that he could scientifically observe his patients' gaits as they waddled or staggered toward him.

But to get back to the eye side, we also find that Woods, too, believes in orthoptics. To be sure this cardinal short-cut to refractive skill on the part of the physician, does not go into much detail as to these treatment procedures to be employed, but the lessons do advise the therapeutic use of such equipment as the Squint Korector, Stereo-Orthoptor, the Keystone aids and the Rotoscope. Woods fails, however, to mention the rather important part optometry played in developing to their present high level of usefulness, these pieces of orthoptic equipment and the individual specialized training techniques which accompany them.

The entire piece of graduate study is typical of the type of refractive training received by hundreds of physicians who are now palming themselves off on a rapidly disillusioned public, as eye, ear, nose and throat men, or as oculists. There is still much cause for regret that the great profession of medicine continues to permit this form of training for its alleged specialists.

BACK ISSUES

We have had some correspondence recently relative to the market for "used" or "back-issues" of the AMERICAN JOURNAL OF OPTOMETRY. In complete volumes, the market is considerably better than that of used cars. Yet were there to be a wave of selling tomorrow, the price would undoubtedly go "smash" and for this reason we advise our readers to hold on to those back numbers they have. Here at the journal office we are

entirely out of issues published prior to 1934 and are also out of a considerable number of issues published since that time. In fact, we make no attempt to keep on hand, sets of back issues, but merely supply the individual numbers as these are called for, so long as the supply lasts.

In 1939, we are told, a complete set of 15 bound volumes of the AMERICAN JOURNAL OF OPTOMETRY (Vol. 1 to Vol. 15 inclusive) was sold, in the east for $140. Not at all a bad investment when these same issues cost the subscriber but $60 in subscription fees and not to exceed $37.50 for binding, and to boot, he had the pleasure of reading all 180 issues.

It has become a rather well established fact in optometry that no practitioner ever throws away a back copy of the AMERICAN JOURNAL OF OPTOMETRY. These issues are constantly being referred to, by these optometrists as most of the technical material contained in them can be found in no other place. This brings up the problem, however, of what to do with the constantly accumulating issues as these are published from month to month. Most readers now have these bound in annual volumes, where they then easily take their proper place as an important part of the practitioner's professional library. In red and black morocco, the present set of 16 books makes an impressive and useful "five-foot-shelf" for the busy practitioner, and as each volume carries its own inclusive index, the entire contents are always immediately available.

APPLICANTS REQUIREMENTS CHANGED FOR OPTOMETRIC PUBLIC HEALTH PROJECTS

In the July issue of the AMERICAN JOURNAL OF OPTOMETRY some comment was made on the Demonstration Eye Care Project sponsored by the Public Health Bureau of the American Optometric Association. These comments dealt with the requirements[1] which had been set up by this department of the A. O. A. for optomtrists wishing to apply as practitioners on this project. The writer is now informed[2] that these requirements have been changed. They now read that any optometrist who is a graduate of an optometric school or college approved by the

[1] Carel C. Koch. Choosing Staff Workers in Optometric Public Health Projects. American Journal of Optometry. Vol. 17, No. 7, pp. 323-324, 1940.

[2] Letter to the editor. August 16, 1940, from Miss Helga Weigert, Administrative Director, Demonstration Eye Care Project, Public Health Bureau of the American Optometric Association.

International Association of State Boards of Optometry, is now eligible for this type of clinical activity. This is a step in the right direction and the Public Health Bureau is to be congratulated in taking this forward, long range view of this vital matter.

The only question which now remains is this. Just what is the position of graduate optometric practitioners of schools which were once recognized by the I. B. B. and which have either gone out of existence or have merged with existing educational centers? Are these licensed men also eligible? It is to be hoped so, as these men are alumni of colleges which were on the same fine educational plane in their day, as are our present professional training centers.

OPTOMETRY AND A NATIONAL CRISIS

At the time of writing these comments, Congress is still in session at Washington. A nation wide conscription bill has passed the Senate and is on the calendar in the House, with passage assured. The country is in the throes of a national election and many of our leaders indicate by action and word, their evident opinion that our country faces shortly an armed conflict. An engagement for which we are as yet, none too well prepared. However, in every direction steps are now underway to make adequate, the national defense measures which will probably play a vital part in shaping the future of us all and our children to come.

And how does the optometric profession stand in relation to these grave issues which now confront us? Are we, too, prepared to do our part to preserve the liberty and freedom for which this western hemisphere has become famous? Obviously an assurance can be given that as a group, the optometrists of America, will respond without reservation to whatever calls are made upon them. Within a few months, many of our younger practitioners will be in the service. Whether they serve in their professional capacities as refractionists or whether they serve with the combatant forces, we know they will live up to the fine traditions of optometry and give to their country a true measure of excellent service.

And while these young men are doing their bit with the military forces, those optometrists who remain at home, too, have an important task to perform. To them falls the duty of taking care of the visual needs of the civil population. A very important job indeed, as good

vision is a vital necessity. Visual impairment at any time is a handicap which should be corrected and in times of emergency, to enable all persons to adequately do their part, these disabilities must be removed. In this the optometrist makes a valuable contribution to the well-being of his fellow citizens and the nation as a whole.

From all parts of the country the optometric outlook is reassuring. A determination to carry on with a spirit of quiet resolution is evident. A spirit which knows no fear and which hopes for the best. No matter what the future may hold we know that our fundamental democratic principles are right and that in the end our just cause will prevail.

A WARNING TO COMMERCIALLY MINDED OPTOMETRISTS

In May of this year, while speaking before the New York State Optometric Association, Dr. Milton E. Loomis, Associate Commissioner of Higher and Professional Education for the State of New York, said, "Optometry obviously has a part in the general health service of the community, and is closely allied to medicine. In fact, in its relation to medicine, it bears an analogous position to dentistry, in that it deals with a special and limited kind of physiological abnormality." He also remarked that, "A profession is not well served when its practitioners conduct business enterprises under the camouflage of professional titles and the protection of professional legislation."

This is a significant statement of policy from one of the heads of the educational department of New York State. Optometrists who persist in commercializing their practices are being warned that their activities will not long be condoned under state wide public health programs.

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THE TAIT SYSTEM OF DYNAMIC SKIAMETRY

Slightly more than ten years ago, the optometrist Tait,[8] presented to optometry, through the medium of the AMERICAN JOURNAL OF OPTOMETRY, a system of dynamic skiametry which now bears his name. During the immediate years which followed the presentation of his technique, this technical publication also presented the views of a group of optometrists [1, 2, 3, 4, 5, 6, 7, 9, 11] who made a number of serious contributions to the literature of optometry dealing with this important subject. Tait's original presentation was clear and comprehensive and stated the principles upon which his system of dynamic skiametry was based. Whitaker[10] followed this, with a supplemental review of the Tait technique which left little to be desired. Members of the profession began to incorporate the technique in their refractive routines where its value soon became apparent.

Most optometric schools and colleges now review for their students the principles of the technique and teach their undergraduate optometric classes to use, or at least understand, this system of dynamic skiametry with which they can supplement and check their other near-point accommodative tests. As ten years have now elapsed since this refractive procedure was first introduced, it is both fitting and proper at this time to review in some detail the underlying theory upon which the test was originally based. The test itself is made in the usual manner of making any dynamic skiametric test with the patient's fixation at the near-point. The chief difference between the Tait system and other dynamic techniques being in regard to the computation of the allowance to be deducted from the dynamic finding and the reasons for making the suggested allowances as outlined by Tait.

He believed that the allowance which must, in most cases, be taken from this finding, depends to a very large degree upon the distance and near-point phoria findings. However, in patients having orthophoria at distance, the near-point phoria finding is the only finding to be taken into consideration. If orthophoria at the near-point is indicated, with no lenses before the patient's eyes, Tait assumed the patient's accommodation and convergence to be in normal balance. In this case convergence is entirely supplied through accommodation. With a near-point fixation of 13 inches and a P.D. of 60 mm, the patient is converging 18 prism diopters which is entirely accommodational. In a case of this kind the dynamic skiametric findings, Tait believed, were correct and could be prescribed to alleviate either an accommodational involvement or a latent hyperopia with no allowance or deduction at all.

Tait believed that the accommodational convergence is fully linked with accommodation and as long as the patient accommodates on the near-point dynamic chart, convergence also must remain fixed. In a patient showing 6△ of exophoria at the near-point, a +1.00 D.Sph., allowance or deduction must be made in the dynamic finding, because in this case 6 prism diopters of the total 18 prism diopters of convergence is supplied through fusional convergence to overcome the near-point exophoria. This deduction must be made in this case, because, when the dynamic skiametric finding is placed before the patient's eyes, the plus lenses will cause a relaxation of accommodation to the extent of 1 diopter because the accommodational convergence is now only 12 prism diopters which is linked with 2 diopters of accommodation.

In a case showing 12△ of exophoria at the near-point, the remaining accommodation-convergence is only 6 prism diopters causing a linking of only 1 diopter of accommodation. In this case an allowance of +2.00 D.Sph. will have to be made from the dynamic skiametric finding. Should a patient have a near-point exophoria of 18△ the convergence is but fusional and an allowance or deduction of +3.00 D.Sph. will have to be made from the dynamic findings.

In cases showing exophoria at a distance, the amount of this exophoria should be deducted from the amount of near-point exophoria to enable the optometrist to arrive at the proper amount of near-point exophoria to use in making his computation. If esophoria is found at a distance the amount of the esophoria must be added to the near-point exophoria in making the basis for the allowance.

Tait drew up the following table as a guide for the proper allowance or deduction to be made from the total or full dynamic skiametric findings.

Near-point orthophoria—no deduction.
3△ exophoria at near-point, deduct 0.50 from dynamic finding.
6△ exophoria at near-point, deduct 1.00 from dynamic finding.
9△ exophoria at near-point, deduct 1.50 from dynamic finding.
12△ exophoria at near-point, deduct 2.00 from dynamic finding.
15△ exophoria at near-point, deduct 2.50 from dynamic finding.
18△ exophoria at near-point, deduct 3.00 from dynamic finding.

It will be noted that earlier writers on the subject of dynamic skiametry, such as Cross in his later writings, Sheard and others, generally agreed that in most cases a deduction of at least +1.00 D.Sph. had to be made from the dynamic findings if these were to be prescribed. These men failed, however, to agree on the reason for making the deduction, a fact which in itself created considerable controversy. From a clinical standpoint Tait's method of dynamic skiametry functions quite well and the discussion of his findings by Fry and Haines in this issue throws additional light on this important matter. In general practice, in the hands of skilled optometrists, the technique as developed by Tait works to advantage to check the subjective near-point tests, and is a technique which may well be incorporated in every refractive routine.

In addition, as is brought out by Swann, in the DIOPTRIC REVIEW, August, 1931, the Tait system of dynamic skiametry is an excellent method of diagnosing a convergence fatigue. In these cases, says Swann,

"After the distance objective and subjective testing have been completed, an against shadow will be seen, showing that the eyes are over accommodating to stimulate convergence through accommodative convergence. When this type of shadow is seen it is a good plan to give the patient a +0.75 D. reading addition combined with 3 prism diopters base-in divided between both eyes. This correction will relieve both accommodation and convergence and bring about visual comfort when other measures may have failed. Dynamic retinoscopy is the only method which will disclose this condition, hence its application cannot be over emphasized."

CAREL C. KOCH.

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WAR TIME SUBSCRIPTION DEPARTMENT

The publishers of the AMERICAN JOURNAL OF OPTOMETRY have arranged a War Time Subscription Department to assure subscribers, who enter the military forces of our country, of receiving their copies of this magazine, monthly. Subscribers are urged to at once forward to this department their new mailing data, giving name and rank, service unit, camp or ship and address, as changes occur in these. Journals will be individually forwarded to men in service irrespective of the number of month to month changes which may occur in these addresses.

—Carel C. Koch.

SPECIAL REPORTS

VARIOUS CONCEPTS OF EYE WORK AND A PLEA FOR A SERIOUS INVESTIGATION OF COLOR THERAPY IN OCULAR PRACTICE*

Norman A. Zevin, Opt. D.
Lehighton, Penna.

In optometry as in other professions, certain changes or metamorphoses are going on. These changes in ideas, techniques and methods of procedure come about due to direct observations of the men who practice the profession in the field. It is true that many of our theories and techniques did and will in the future originate in scientific laboratories where control and strictness in detail are essential and maintained, but the final evaluation for any scientific idea must be in the field, to prove that the idea is usable and practicable on real patients, not scientific robots.

The above is simply a statement of fact. From here we may go on to the premise that it is a distinctly difficult matter to change an individual's viewpoint, whether it be social or scientific. I might say that it is more difficult to change a scientific mind since the scientist is as a rule, and rightly so, extremely skeptical of trends of thought divergent or opposite from ideas or facts which have had an apparently proven basis. Therefore, I might say that I am treading on dangerous ground when I attempt to write in disfavor or at least attempt to point out certain beliefs which have been ingrained in the minds of men doing eyework; points which I believe to be fallacious. If, however, the proof offered by men propounding certain ideas in eyework is poor, then the ground upon which the dissenter treads becomes less assailable. Before I mention some of the ideas which seem rather odd to me, I might say that I myself have been guilty of the same thoughts of which I now accuse others. However, when new facts are seen, especially demonstrable clinical facts, then it becomes necessary to change one's viewpoint.

Let us go directly into the heart of the matter; it is essential therefore that I propound a few questions. . . . Just where can one find proof that an individual having what we optometrists call a normal pair of

*Submitted for publication June 19, 1940.

eyes, should have orthophoria or a few degrees of exophoria? Is a patient abnormal because he has low ductions? Or abnormal because he has a low reversion to fusion? Or abnormal because he has a vertical phoria? Must vision be exactly 20/20 to be normal? These are only a few of the questions that should occupy the thoughts of optometrists in dealing with ocular problems.

As I have said before, we are all guilty of working on cases without stopping to ask ourselves certain questions. We continually see patients who have been comfortable with an uncorrected hyperopia; with very unusual ductions; high phorias, who complain of nothing but poor vision. Then, too, we continually come across patients who present the same objective findings and complain of a number of various symptoms. And again we find patients who present the same findings, yet complain of no symptoms whatsoever. While the last statement should be amazing to us, the most disturbing thing is that we optometrists are not as a rule amazed. If we find abnormal findings with no symptoms we sometimes question our work, but when we have symptoms with those same findings in another patient, we emphasize these findings and write articles about these abnormalities being the cause of most of the subjective symptoms.

Let us stop and think. . . . Let us review our work and not take everything which is offered to us for granted. Just because some eminent refractionist of the 1890-1910 period said that all patients with 4△ of exophoria at 6 meters should be uncomfortable, does not mean that we should accept his statement as a fact without questioning it. You and thousands of other refractionists have found patients with an exophoria of 4△ to 5△ who were perfectly comfortable. These patients had no trouble. Then too, the patient that has 1.00 D. of uncorrected hyperopia and who has no headache and whose eyes do not bother him while reading. On the other hand the patient who has 0.50 D. of uncorrected hyperopia who has headaches when this is not corrected. The odd part about this is the fact that there are thousands of persons walking the streets with their uncorrected refractive and neurological problems who do not come into our offices because they have no symptoms. Why is this true? And what can be done about it? In my judgment, it now requires some sound technical investigation in place of taking the statements of others for granted. Our job is not only the discovery of symptoms and their correction. We must also try to go deeper and find all possible causes, so that future trouble may be prevented for the patient.

The paradoxes of comfort and discomfort that I have mentioned are only a few of many which occur. If we would take 500 visually comfortable persons and examine their eyes, we would find many different results as to phorias and ductions as well as uncorrected refractive errors of all kinds.

It might be well too, at this point, to mention a fact which we, as optometrists are apt to overlook. All specialists, as a rule, have certain "pet" beliefs, one being that their particular speciality is capable of curing the patient of his symptoms, i.e., the oculist and optometrist think the discomfort, either ocular or cranial, is due to the eyes—until proven otherwise. The dentist thinks the symptoms are due to poor teeth—until proven otherwise. The throat specialist assumes the patient's symptoms are due to poor tonsils, and so on through the role of specialities. Obviously, all this cannot be the case. The seat of the symptoms is not always in the eyes nor is it always in the teeth or the throat.

It is quite probable that throughout all these years there have been numerous men who realized there was something deeper in many of their problem cases than just the need for glasses. However, whether they were optometrists or oculists, in a majority of cases they simply prescribed lenses; advising further investigation as to systemic involvements only as a last resort when lenses failed to give the desired results. Is it not conceivable then, that since, in the majority of cases, in which we have difficulty in relieving the symptoms, there might also be adequate proof that cases which do derive relief from lenses only, also may have a possible systemic, physiologic or psychologic background which, when also removed might result in the further acceptance of weaker corrections, with even still greater comfort.

Naturally being eye men we are prone to turn our attention away from a possibility of this sort. However, when cases are presented showing that the removal of general somatic disorders or the correction of imbalances of the nervous system, does in these cases make the need for ocular correction no longer necessary, then we must face certain facts. We cannot continue the attitude that some of us possess in brushing these facts aside. Such an attitude is as a rule indicative of extreme narrow-mindedness, an attitude for which there is no room in any technical field, whether it be medicine, optometry or any allied profession. We must be fair and open minded to all ideas and techniques whether they first sound "impossible" or not—for out of thousands of so-called "im-

possibilities" there may sometimes come an important thought or technique.

It is without any apology that I say now, that when I first heard of the results certain individuals claimed they were obtaining by the proper and correct therapeutic use of portions of the visible spectrum, that I for one was skeptical. I did not investigate. I did not try it. Yet I was strongly opposed to the ideas and methods employed. I said that such claims which these individual refractionists made sounded impossible and must be wrong. How could one possibly change an individual's response by means of color therapy? How could one possibly relieve an ocular headache by means of these treatments? How could one relieve burning and tired eyes by the mere use of portions of the visible spectrum? These and many other assertions made me dubious of the entire matter. Yet the continual claims by well known optometrists gradually weakened me to the point where I decided to disregard my former conclusions and see for myself whether or not there was anything to this particular therapy.

Later, when further advanced in the use of these modalities, I decided to place somewhat less reliance on such ocular findings as ductions and phorias. I found, I could dispense with orthoptics in certain cases and still get results. Getting deeper into the work I found that my enthusiasm for these techniques was shared by hundreds of other men working with selected portions of the visible spectrum, who also were getting unusual results in certain cases.

It became an interesting experience to relieve a patient's headache in a few moments, to make another patient ocularly comfortable after a few short treatments. To see young patients change from nervous irritable youngsters to quiet-settled children who begin to feel better, eat better and sleep better. It improved one's confidence as an optometrist when elderly patients came in, telling how they could see better, felt better, slept better, work harder and faster without tiring. Aside from correcting ocular errors of refraction I had treated these patients' eyes for specific ocular conditions using color frequencies in various ways as indicated by the symptoms, findings, etc. The results were for the most part good. To be sure there were occasional failures, but for the most part the results were very satisfactory.

It is not within the sphere of a communication of this kind that definite technique and methods be discussed. This is written as a "plea"

that before our technical journals, educators and schools, to which the men in the field must look for guidance, deride and discriminate against certain ideas, those ideas should be investigated thoroughly and honestly with the aid of individuals informed and competent to judge the subject. Techniques should be investigated so that all optometrists may benefit from the results obtained. The majority of optometrists upon questioning, will investigate a therapy or a method only upon the recommendation of a technical journal or an educator so that it becomes essential for our schools to investigate and report without further delay on the entire question of the use of selected portions of the visible spectrum in ocular work. A study of this sort would be appreciated.

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LEHIGHTON, PENNA.

ORGANIZATION AND JURISPRUDENCE

by Clarence W. Morris

A department in which some of the organization problems of Optometry will be discussed and in which certain of the legal aspects of refractive work will be reviewed.

THE BOARD OF STANDARDS FOR PUBLIC SERVICE

The Cincinnati Convention of the American Optometric Association adopted Resolution No. 4 establishing a "Board of Standards for Public Health Service which shall determine the qualifications of the practitioners in optometry for such or similar service." The wording of this resolution is somewhat ambiguous and therefore the determination of the specific objective of this resolution is difficult.

There are two possibilities to the apparently uncertain function of this new Board. The first is, that the purpose of this Board will be to determine, what qualifications for the practice of optometry in public health work are found in the optometric profession. The second possibility is, that the duty of this proposed Board will be to determine what qualifications optometrists must possess for public health or similar service. In the latter event it becomes obvious that possession of a certificate to practice optometry by a state Board may become inadequate. Which

of these two purposes this resolution is intended to serve needs to be clarified.

Whatever may be the specific objective of this resolution, one may suspect that it is directed towards the goal of requalifying optometrists for public health service. It would appear, therefore, that the undesirable features of the Los Angeles Resolution No. 17 have been reincarnated in Resolution No. 4 at Cincinnati. Requalification of optometrists is only a preliminary step to differentiation between those optometrists who possess suggested new qualifications and those who lack such fitness.

Furthermore, the attempt to requalify the practitioners of optometry is without precedent in other professions. Can any one cite an instance wherein a national association of any profession in the healing arts has passed a resolution which caused its own members to be differentiated into two classifications such as the "qualified" and the "unqualified?" Has any professional group undermined its own legal status by officially requiring qualifications for competence over and above those legally adopted by the state?

Requalification of optometrists should not be confused with the problem of qualification for specialties. The certification of a specialty within a profession by a voluntary board is a different matter from the requalification of members of a profession to practice that for which they have already been qualified by a state examination. The only conceivable justification for inviting members of a profession to requalify themselves would be in the event that the profession sought to widen its scope of practice. For example, when a certain non-medical professional group undertook the enlargement of its scope of practice to include the use of narcotics, antiseptics and other limited classifications of drugs and surgery, it then became necessary to requalify its members. This requalification was accomplished by the regular state boards through examination and state certification. The employment of a national board where no enlargement of the scope of practice or qualification for specialties is involved, presents grave problems for optometry.

Requalification under the Board of Standards for Public Service will probably involve other unnamed agencies. It is apparent from Resolution No. 4 that the Board is not empowered to determine the qualifications of the individual optometrist by examination. What agency will perform this function?

The attempt to requalify optometrists through the agency of a national board which enjoys no legal status appears to be a dangerous experiment for optometry. It is an experiment without precedent in any comparable profession. Its probable effect will be to undermine the state boards of examiners in optometry. We should not lose sight of the fact that, regardless of what may become the agency of salvation for optometry in the future, our present position rests upon the foundation of our state boards and state legislation and our private schools of optometry. In the last five years we have seen presented at our national conventions numerous resolutions, the effect of which seemed to be the undermining of our state boards and private schools. This no doubt was not the objective of those who formulated Resolution No. 4 but that does not mean that requalification of optometrists by a national board without legal status would not have that very effect and undermine our state boards and the legal structure on which they rest.

An optometric organization which does not officially represent all of optometry may have more liberty of action in matters like requalification than does the American Optometric Association. If such an organization seeks to requalify only its own members, that act does not necessarily involve any hazards to optometry, because the organization does not represent the entire profession. On the other hand, however, since the American Optometric Association is the official organization representing the entire profession of optometry it certainly should not be involved in any requalification of optometrists. The American Optometric Association should not develop Resolution No. 4 along lines which would repudiate the competence of any optometrist or the authority of any state board which has certified such competence.

PROCEDURE AND INSTRUMENTATION

By Guy L. DuPlessis

A department wherein discussions will be carried on relative to the value of various experimental and clinical techniques as employed by practicing optometrists, and also in which the instruments used by optometrists in various phases of their work, will be subjected to some critical evaluation.

THE MILLER NEAR-POINT FIXATION UNIT

The Miller Fixation Unit is a self illuminated near-point target combining all the test objectives necessary to complete the technic of near-point refraction as advocated by the optometric extension program. The optometrist, Dr. J. P. Miller, of Ashland, Nebraska, designer of this device, claims that its chief virtue is to speed up these near-point tests, thus encouraging greater thoroughness in that phase of refractive work.

Quoting Dr. Miller, "It is interesting to note that many pretend to know and use the new technic of 21 point work as required by the Graduate Clinic Foundation, but few really apply it in their own office practice." The Miller Fixation Unit is designed to obviate this, by assisting in simplifying the procedure itself. This piece of equipment, devised by him, is to be attached to a phorometer and can be quickly swung into position when required.

THE NEW PLASTIC CONTACT LENS

Optical Research, Inc., of New York City announces that a plastic contact lens trial set consisting of 15 spherical and toric lenses is now available to optometrists. This contact lens differs from the original Feinbloom plastic contact lens in that a mold or impression of the anterior surface of the eye is not necessary. These contact lenses are similar in construction to the molded plastic lens, but are fitted by the use of the contact trial set. It is said that no drugs or anesthetics are necessary.

DERMATITIS FROM ELASTI-GLASS GARTERS AND WRIST WATCH STRAPS

Irwin P. Ziesler, M.D., reports, in the June, 1940, issue of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, two cases of

dermatitis caused in the writer's judgment by the synthetic rosin known as elasti-glass. This synthetic is similar to that used in plastic contact lenses. The article describes the injuries in these two cases and speculates on the cause of the dermatitis as being due to one or more materials used in its manufacture. The exact cause remains unknown and the article is referred to in these pages only because the plastic used in contact lenses might, in the case of a hyper-sensitive person, cause a reaction wrongly attributed to a mechanical irritation.

POLAROID FOR EXPERIMENTAL USE

Polaroid, the trade name for a polarizing material made of aniline crystals is available from the *Polaroid Corporation,* Cambridge, Mass., in two types of material namely: Polaroid glass and polaroid film. Each of these two materials is available in a commercial grade and a laboratory grade. I believe that for optometric use the commercial grade should prove satisfactory. Polaroid glass consists of a layer of cellulose acetate containing the polarizing crystals bound between two sheets of glass. This glass does not lend itself to cutting or edging very readily and should therefore be ordered in the exact size to be used. Polaroid film, however, can be cut to any size or shape wanted by the user, though it is optically inferior to Polaroid glass. The use of Polaroid in various optometric techniques involving the dissociation of two eyes offers many interesting possibilities for the improvement of old technics and the development of new ones.

THE PHOTOMET

The Photomet, product of *G. M. Laboratories,* is a super sensitive portable photo-electric foot-candle meter. It is available in a number of models of various foot-candle ranges and can be had with multiple photo-electric cells for greater sensitivity. One model has a sensitivity of 1/100 foot-candle per scale division. This instrument employs a gold wire suspension galvanometer for greater sensitivity. The Photomet should be of interest to optometrists whose experiments involve the measurements of low levels of light intensity.

BOOK NOTICES

THE PRINCIPLES OF BINOCULAR FUSION AND STEREOSCOPIC VISION. Clinical Research Report, Number 6. Ray Morse-Peckham, director. The Optometric Research Institute, publishers. 211 Woodworth Avenue, Detroit, Michigan. Illustrated. Board Covers. $1.00. 1940.

This brochure outlines the physio-psychological principles involved in the perception of form and perspective and aims to inculcate a better understanding of that psycho-physiological process known as stereoscopic vision. It is an attempt at simplification of the subject without sacrifice of detail and is written for optometric consumption. This booklet of 138 pages is number six of a series of eight written and published by the *Optometric Research Institute*. It is recommended for the optometrist who wishes to add to his knowledge of the principles of stereopsis.

G. L. DuP.

THE OPHTHALMOSCOPE. Published by the American Optical Company. Southbridge, Mass. Illustrated. Board covers. 1940.

This booklet is available without cost from the *American Optical Co.* and is mentioned because it includes some excellent drawings of five ocular conditions frequently encountered and at times overlooked by refractionists, namely: Sclerosis of the retinal vessels, arteriosclerotic retinopathy, diabetic retinopathy, hypertensive neuro-retinopathy and papillaedema as well as a bibliography relating to these conditions.

G. L. DuP.

FACES. Published by the Better Vision Institute, Rockefeller Center, New York City. Illustrated. Board covers, 1940.

Eight basic face shapes are analyzed to determine the aesthetically most desirable forms of eye wear required. The brochure is replete with illustrations to convey the author's ideas in the selection of spectacles. Diagrammatic sketches exaggerating facial contours are a further aid to the reader.

G. L. DuP.

THE TILLYER PRINCIPLES IN OPHTHALMIC LENS DESIGN. Paul Boeder, Ph.D. Published by the American Optical Company, Southbridge, Mass. Illustrated. Board covers. 1940.

This book is a short historical account of development of improved design in ophthalmic lenses beginning with Ostwalt in 1898 up to the design of Tillyer lenses in 1924. This Tillyer design is described as "a lens of prescribed axial power for those oblique pencils which, after refraction by the lens, go through the center of rotation of the eye." The author then explains in simple language how the Tillyer series fulfills this requirement. G. L. DuP.

LECTURES ON MOTOR ANOMALIES. A. Bielschowsky, M.D. Published by the Dartmouth College Publications. Hanover, N. H. Material re-printed from the American Journal of Ophthalmology. Illustrated. Board covers. $1.00. 1940.

This work is posthumous, as Bielschowsky died in January, 1940. This book of 123 pages contains twelve lectures on the physiology and abnormalities of ocular movements, their etiology, development and course, together with the surgical and non-surgical treatments of heterotropias.

As a result of his association with the Dartmouth Eye Institute, Bielschowsky subscribes to the belief that aniseikonia is a cause of certain types of heterotropias, particularly those not predicated by ametropia. He reports a number of cures of convergent squint by application of iseikonic lenses. That single departure from the ancient and honored concepts of heterotropias would justify this publication.

—G. L. DuP.

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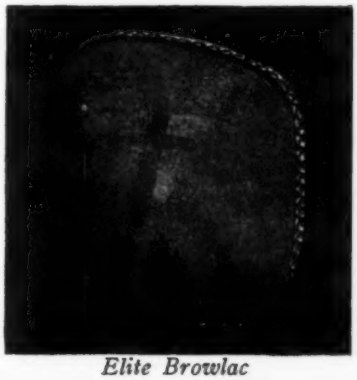

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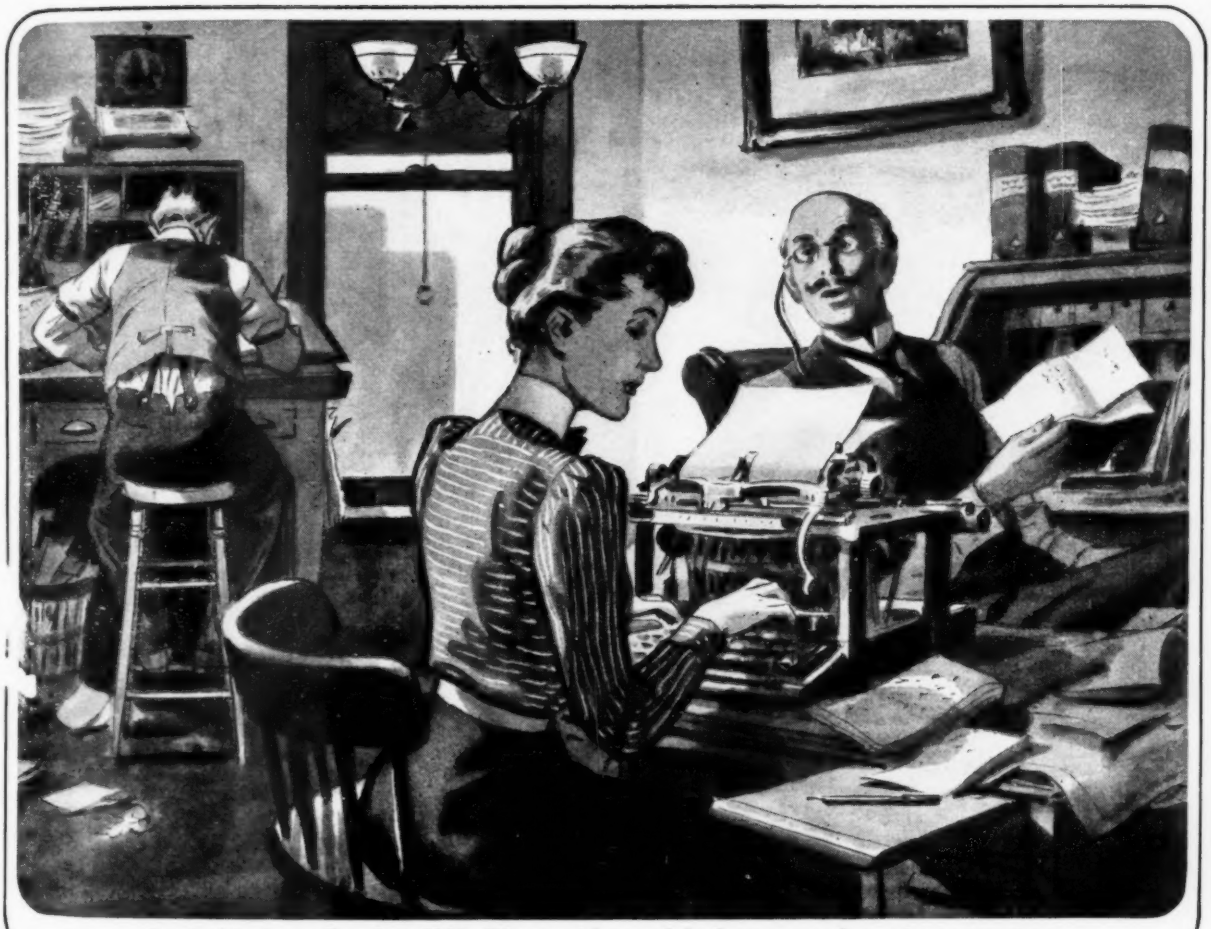

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